(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 304 831 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
23.04.2003 Bulletin 2003/17

(51) Int Cl.[7]: **H04L 12/26**, H04L 12/24

(21) Application number: **02396118.8**

(22) Date of filing: **17.07.2002**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR IE IT LI LU MC NL PT SE SK TR
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **16.08.2001 FI 20011657**

(71) Applicant: **Sonera Oyj**
00510 Helsinki (FI)

(72) Inventors:
- **Korhonen, Jouni**
  11100 Riihimäki (FI)
- **Laukkanen, Mikko**
  02600 Espoo (FI)
- **Laamanen, Helmo**
  00370 Helsinki (FI)

(74) Representative: **Simmelvuo, Markku et al**
Papula Oy,
P.O. Box 981
00101 Helsinki (FI)

(54) Monitoring and transmission of QoS-data in a telecommunication network

(57) The invention concerns a method and system for monitoring, transferring and distributing channel-specific QoS data in a packet-switched mobile communication network, in which method QoS data is collected in an element of the mobile communication network. According to the invention, the QoS data is carried in extension fields of IP header data. The invention also concerns a monitoring agent for monitoring, transferring and distributing channel-specific QoS data in a packet-switched mobile communication network.

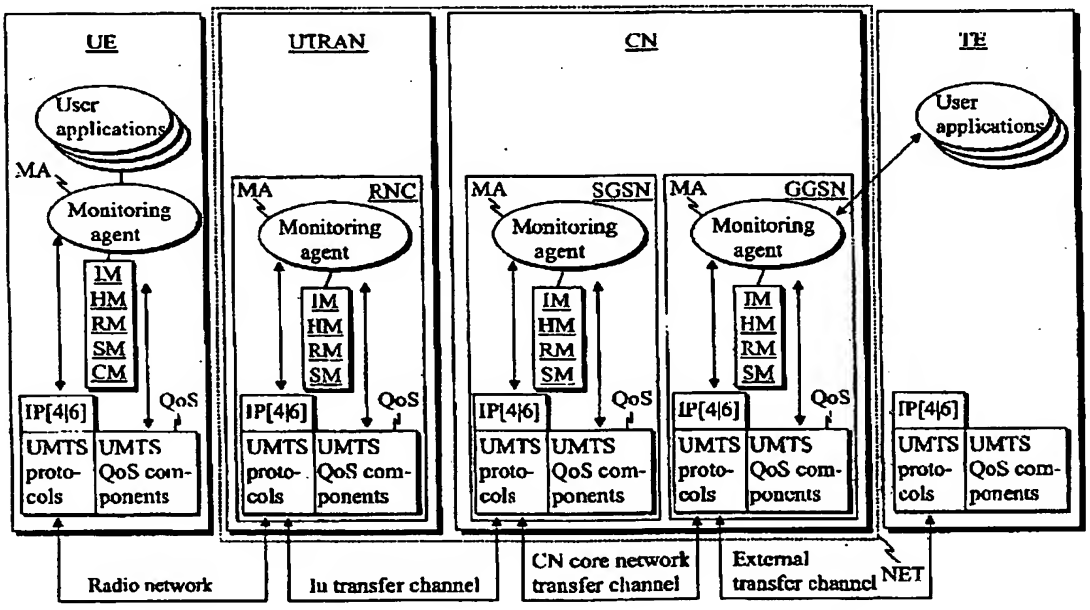


Fig. 1

EP 1 304 831 A2

Printed by Jouve, 75001 PARIS (FR)

Description

FIELD OF THE INVENTION

[0001] The present invention relates to telecommunication technology. The present invention concerns a method and system for distributing, transferring and monitoring QoS data in a packet-switched mobile communication network.

BACKGROUND OF THE INVENTION

[0002] Wireless connection technology for connecting to different telecommunication networks is becoming increasingly important and favored in systems using the IP protocol (IP, Internet Protocol). At present, the prevailing connection technology is that using wired connections. The Internet is a packet-switched network, in which it is traditionally not possible to guarantee successful transmission of packets. The Internet is a so-called "best effort" network. As it is not possible to provide a guaranteed quality of service, there are variations in communication parameters essential to service, e.g. transfer rate, delay, variation of delay, error ratio, etc. Most applications, e.g. speech communication, real-time video images etc. transmitted in a packet-switched network are subject to variations of quality of the telecommunication connection.

[0003] The variation of quality of service has created a need to be able to guarantee a certain level of quality of service (QoS) regarding transmission of information over the Internet. In telecommunication networks, network performance is described, among other things, in terms of data transfer speed in transmissions of information from a sender to a receiver. Quality of service (QoS) describes the performance of the data stream in transmitting an IP packet from sender to receiver. Quality of service (QoS) is measured e.g. in terms of transfer rate, delay, variation of delay and error ratio. To solve the problem of guaranteeing a certain level of quality of service, it is possible to use e.g. the Integrated Services (Int-Serv) architecture (RFC 2211, RFC 2212, RFC 2215) and the RSVP protocol (RSVP, Resource Reservation Protocol) (RFC 2205, RFC 2206, RFC 2207, RFC 2208, RFC 2209, RFC2210). In addition, a Differentiated Services model (DiffServ) has been presented. The UMTS (Universal Mobile Telecommunication System) is a third-generation (3G) mobile communication system that allows wide-band wireless data transfer. The UMTS is a packet-switched mobile communication system in which it is possible to transmit both speech, video images, text and multimedia content at a rate of almost 2Mb/s in the most favorable case. The UMTS allows mobile terminals to communicate with a telecommunication network via fast packet-switched connections over a large geographic area. However, the level of quality of data transfer may vary considerably depending on location, time and network load. Traditional mobile communication systems are mainly of a circuit-switched type, in other words, the connection to be set up is reserved from end to end for the entire duration of the connection.

[0004] However, packet-switched communication involves several problematic issues. An IP-based packet-switched network is basically a "best effort" network, in other words, packets are transmitted to their destination within the limits allowed by the network, without providing any guarantee of packets reaching their destination. Problems relating to a packet-switched network were already discussed above.

[0005] The 3G TR 23.907 (version 1.1.0) is a specification of the QoS concept, defining for an UMTS network QoS functions serving to collect QoS data from different elements of the UMTS network.

[0006] Traditionally, QoS data is collected by applications requiring such data. In addition, QoS data is commonly distributed over the network using protocols specialized for this function, which in practice are often application area-specific. The distribution of QoS data is implemented as one-way feedback, and in addition the protocols may get stuck on a firewall. The protocols used for distribution of QoS data often require the set-up of a separate session. UMTS network-specific information is not obtained by merely monitoring end-to-end traffic. In addition, the protocols used for distribution of QoS data produce an extra load on the network.

OBJECT OF THE INVENTION

[0007] The object of the invention is to eliminate the above-mentioned drawbacks or at least to significantly alleviate them. A specific object of the invention is to disclose a method and system that enable QoS data to be monitored, transferred and distributed in a new way in a packet-switched mobile communication network.

BRIEF DESCRIPTION OF THE INVENTION

[0008] The present invention relates to a method for monitoring, transferring and distributing QoS data in a packet-switched mobile communication network. In the method, monitoring agents collect QoS data from the elements of the mobile communication network. According to the invention, the QoS data is transferred in extension fields of IP address data. Each QoS value is preceded in the IP packet by a header field that tells the desired QoS data. The header

EPODOC: <EP_____1304831A2_I_>

extension field consists of a message type field, a requester field, a direction field and a type field. The transmission of QoS data works on the request - reply principle. The request is sent in a Request field and the reply in a Replied field. To add QoS data to an IP packet, methods of forming an extension header as defined in the RFC791 or RFC2460 are used. An IP packet provided with QoS data must not be fragmented. This is preferably indicated by using a "don't fragment" bit.

[0009] The information transmitted in the extension headers of IP packets can be pre-processed and refined so as to give it a form used by applications that need QoS data.

[0010] The invention also concerns a monitoring agent for transferring and distributing channel-specific QoS data in a packet-switched mobile communication network. According to the invention, the monitoring agent comprises information retrieval means for retrieving QoS data from QoS components of the packet-switched mobile communication network, processing means for pre-processing and refining QoS data, setting means for setting QoS data into the header extension field of an IP packet, and removing means for removing QoS data from the header extension field of an IP packet.

[0011] In an embodiment of the invention, the monitoring agent also comprises communication means for distributing QoS data to applications that use QoS data.

[0012] The invention also concerns a system for transferring and distributing channel-specific QoS data in a packet-switched mobile communication network. The system comprises a packet-switched mobile communication network, a terminal communicating with the packet-switched mobile communication network and QoS components used to collect QoS data from different elements of the packet-switched mobile communication network. According to the invention, the system further comprises an application agent, which comprises information retrieval means for retrieval of QoS data from QoS components of the elements of the packet-switched mobile communication network, processing means for pre-processing and refining QoS data, setting means for setting QoS data into the header extension field of an IP packet, and removing means for removing QoS data from the header extension field of an IP packet.

[0013] In an embodiment of the invention, the system further comprises communication means for distributing QoS data to applications that use QoS data.

[0014] In an embodiment of the invention, the IP packet is consistent with the IPv4 or IPv6 version.

[0015] In an embodiment of the invention, the packet-switched mobile communication network is an UMTS network.

[0016] The present invention enables QoS data to pass through firewalls if the IP packet in question at all has a possibility to pass through a firewall. In addition, QoS data is not limited to the QoS data of an end-to-end connection; instead, the QoS data of every UMTS network element in which a monitoring agent as disclosed in the invention has been implemented is available. Furthermore, in the present invention QoS data is not application-specific but covers all communication. No session is needed for the transmission of QoS data; instead, QoS data is carried along with IP packets. In addition, in the present invention, a prompt reaction to a change in QoS data is possible.

[0017] In an implementation according to the present invention, UMTS network-specific information is obtained directly from the network itself, not only by monitoring end-to-end communication. Moreover, the QoS data is indifferent to the application and protocols used, and no session needs to be set up between applications to allow distribution of QoS data. As no separate protocol is used for distribution of QoS data, no extra signaling load is imposed on the network.

LIST OF ILLUSTRATIONS

[0018] In the following, the invention will be described in detail by the aid of a few examples of its embodiments with reference to the attached drawings, wherein

Fig. 1 presents a preferred example of the system of the invention, and
Fig. 2 presents a preferred signal flow diagram example of the operation of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0019] The system presented in Fig. 1 comprises user equipment UE (UE, User Equipment), a radio access network UTRAN (UTRAN, UMTS Radio Access Network), a core network CN (CN, Core Network) and terminal equipment TE external to the UMTS network. Of the telecommunication network NET in Fig. 1, only components and functionalities essential to the invention are shown.

[0020] The QoS Concept specification (3G TR 23.907 1.2.0) defines QoS functions to be used in an UMTS network to monitor and maintain the level of quality of the UMTS network. These functions are referred to only as a single set of functions (UMTS QoS components), which enable the transmission of QoS data over a manufacturer-specific interface to applications. IPv[4|6] refers to the IP protocol version (IPv4 or IPv6) used, under which the UMTS network-specific protocols operate.

[0021] In the system presented in Fig. 1, QoS data obtained from the UMTS QoS components is transmitted to a

EPODOC: <EP. . . . . 1304831A2_I_>

monitoring agent MA. The monitoring agent MA has three functions, the first of which is to pre-process and refine QoS data into a form suited for applications. These activities include e.g. the calculation of transfer rate, standard deviations and calculation of percentages e.g. in loss of packets. A monitoring agent MA is placed at least in the user equipment UE, in the RNC and in the SGSN (SGSN, (Serving GPRS Support Node) and GGSN (GGSN; GPRS Gateway Support Node). If necessary, a monitoring agent MA may also be placed in other network elements than those presented in Fig. 1.

[0022] The second function of the monitoring agent MA is to transmit QoS data in the network, using IPv4 or IPv6 headers. The interface between the monitoring agent MA and the IP layer to be used is operating system/implementation specific, because the implementation of the IP layer may vary depending on operating system and manufacturer.

[0023] The third function of the monitoring agent MA is to distribute QoS data to user applications. It is to be noted that this functionality is only needed in user equipment, not in the network elements of the UMTS network. For this purpose, the monitoring agent MA comprises communication means CM for the distribution of QoS data to applications that use QoS data.

[0024] For distribution of information, the monitoring agent MA uses the FIPA-ACL (FIPA, Foundation for Intelligent Physical Agents; ACL, Agent Communication Language) language, which is used in communication between agents. In addition, the monitoring agent MA provides two ways of requesting QoS data: by direct query and by subscribing. In the case of direct query, the user application sends to the monitoring agent MA a query about current QoS data and the monitoring agent MA responds to the query immediately. When the subscribe mode is used, the user application sends to the monitoring agent MA a subscription in which the monitoring agent MA is requested to send a notification every time the QoS data changes according to certain criteria, or to notify at time intervals specified in the subscription. The above-described interactions and the message formats used in them are described in the FIPA Nomadic Application Support Specification documents.

[0025] A monitoring agent MA according to Fig. 1 comprises information retrieval means for retrieving QoS data from the QoS components QoS of the elements of the packet-switched mobile communication network, processing means HM for pre-processing and refining QoS data, setting means SM for setting QoS data into header extension field of the IP packet, and removing means RM for removing QoS data from the header extension field of the IP packet. The means listed above are implemented in a manner known in itself, e.g. by software, and they will not be described here in detail.

[0026] Fig. 2 presents a preferred signal flow diagram example illustrating the operation of the invention. As indicated by arrow 20, a user application creates an original IP packet, which is to be sent into the network. The monitoring agent MA in a mobile station UE adds a QoS header field according to the QoS data wanted by the user, arrow 21. The QoS data is carried in the IPv4 and IPv6 header data extension fields. An IP packet provided with QoS data must not be fragmented, so in IPv4 the DF (don't fragment) bit has to be set. Likewise in IPv6 the sending node must not fragment the IP packet. QoS data is transmitted in a Request - Reply fashion. Desired QoS data is requested by a Request field and the reply to the request is received in a Replied field in the return packets. Requests that cannot be carried out are indicated by a NotSupported field.

[0027] As indicated by arrow 22, the mobile station UE sends a packet provided with a QoS header to the radio access network section (RAN, Radio Access Network). The radio access network section RAN also contains a monitoring agent MA, which reads the QoS header, adds a QoS value to it if necessary and sends the packet provided with an updated QoS header further to the core network CN, e.g. SGSN, arrows 23 and 24. A component in the core network CN also comprises a monitoring agent MA, which reads the QoS header and, if necessary, adds a QoS value, arrow 25. The monitoring agent MA of the core network CN saves the QoS header, removes the saved QoS header from the IP packet and sends the original IP packet to the terminal equipment TE, arrows 26 and 27. IP packets provided with QoS data are not allowed to get out from the core network CN; instead, either the GGSN or ultimately a specific QoS node behind the GGSN removes the QoS fields from the IP packets.

[0028] As indicated by arrow 28, the terminal equipment TE sends the original IP reply packet over the core network CN. In the core network CN, the QoS header that was saved earlier is added, and if necessary, a QoS value is added as well, arrow 29. The packet provided with updated QoS data is sent back to the radio access network section RAN, arrow 30. The radio access network section RAN reads the QoS header, adds a QoS value if necessary and sends the packet provided with updated QoS data to the mobile station UE, arrows 31 and 32.

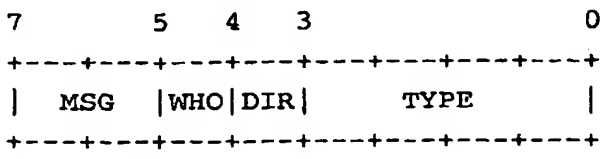
[0029] The monitoring agent MA in the mobile station UE reads the QoS data from the IP packet and removes it, arrow 33. Thus, the application program in the mobile station UE receives the original IP reply packet, arrow 34.

[0030] The counterpart of the mobile communication network user equipment UE may also be another piece of user equipment UE in the UMTS network and not necessarily a network element in a wired network (Internet, PSTN, ISDN, etc.). Requesting and adding QoS data to the IP packets requires that the IP stacks of the UE, RNC and GGSN (of the specific QoS node behind the GGSN) continuously modify the IP packets. For example, if the RNC receives an IP packet provided with a Request message, then the IP stack of the RNC must add the desired QoS data to the IP packet, providing it with a Replied field, and remove the original Request field.

[0031] In both IPv4 and IPv6, the presentation of the QoS data itself in the IP header is identical. Each QoS value

is preceded by an eight-bit header field, which tells the desired QoS data. The length of the entire QoS header field and of the QoS data depends on the information desired.

[0032] The structure of the header field is presented below:



MSG: Type of QoS message

- 00 Request
- 01 Replied
- 10 Not supported
- 11 Not defined

WHO: Who is requesting QoS data, UE or Core

- 0 UE
- 1 Core (GGSN / QoS node)

DIR: From which direction is the data to be obtained, Uplink or Downlink

- 0 UL
- 1 DL

TYPE: QoS data desired

0000	line rate
0001	packet drop rate
0010	BER
0011...1111	not yet defined

[0033] In the Replied messages, the required QoS data is added after the Replied field. Data added may be of fixed or variable length. The QoS data are included (so-called PiggyBagging) in IP communication (TCP/IP, TCP, Transmission Control Protocol, UDP/IP; UDP, User Datagram Protocol, Internet Control Message Protocol (ICMP), ...). If necessary, the user equipment UE and the network element of the UMTS network echo back the Request and Replied messages. No IP messages are generated expressly for the distribution of QoS data only.

[0034] In the following, two examples illustrating the echoing back of the Request and Replied fields are presented:

1. UE requests downlink bit error ratio (BER) and for some reason RNC is unwilling to put downlink QoS data into IP packets going in the uplink direction and requested by UE. In this case, the UMTS network element echoes the Request message into the next IP packet going in the downlink direction.
2. UE requests uplink bit error ratio (BER) and RNC adds the required QoS data to the Replied field in the IP packet and removes the Request field. The UMTS network element detects that the UE is asking for the QoS data in question. In this case, the UMTS network element echoes the Replied field including the QoS data into the next IP packet going in the downlink direction.

[0035] The IP stacks that add QoS data to IP packets and mend said data have to be able to carry out the required optimization. In the following, two examples of undesirable combinations are presented:

1. Going from a UMTS network element towards UE is an IP packet in which the Replied field contains uplink BER data (requested by UE) and at the same time a request for uplink BER data (requested by Core). The UMTS network element should be able to utilize the already available Replied field BER data, which is to be echoed in

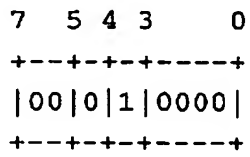
BNSDOCID: <EP_____1304831A2_I_>

any case.

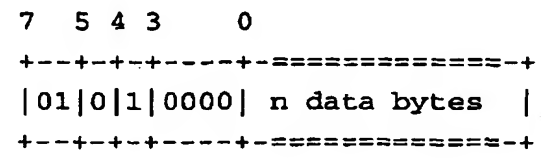
2. Going from a UMTS network element in the direction of UE is an IP packet containing a downlink BER Request originated by UE and a downlink BER Request originated by the UMTS network element. The UMTS network element should drop the downlink BER Request field originated by UE, because UE must in any case echo back downlink BER data in the Replied field.

[0036] In the following, a few examples of the use of Request-Reply options will be presented:

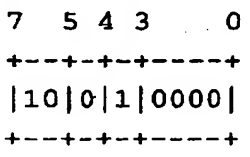
1. A downlink Line rate Request by UE:



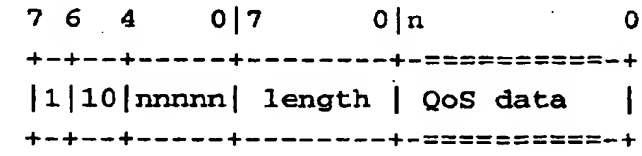
2. A Replied downlink Line rate echoed by a UMTS network element to UE in response to UE's request:



3. A NotSupported in reply to UE's downlink Line rate request (UMTS network element sends to UE):

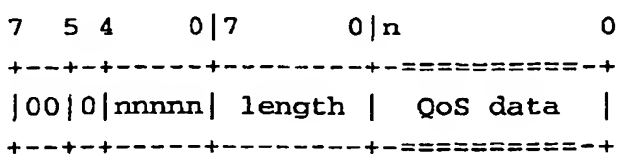


[0037] When QoS data is to be added to an IPv4-protocol packet, normal ways of making an extension header are used, as defined in the RFC791. The composition of the Option type field is presented below. The QoS data (several items of QoS data can be placed under a single extension header) and information are coded into the IPv4 extension, placed after the Option type as "variable length" type data:



[0038] Nnnnn is the extension type number, which has to be registered via the IANA (IANA, Internet Address Naming Authority).

[0039] When QoS data is to be added to an IPv6-protocol packet, normal ways of making an extension header are used, as defined in RFC2460. The composition of the Option type field is presented below. The QoS data (several items of QoS data can be placed under a single extension header) and information are coded into the IPv6 extension, placed after the Option type as "variable length" type data:



[0040] Nnnnn is the extension type number, which has to be registered via the IANA.

[0041] The invention is not restricted to the examples of its embodiments described above; instead, many variations are possible within the scope of the inventive idea defined in the claims.

Claims

1. Method for monitoring, transferring and distributing channel-specific QoS data in a packet-switched mobile communication network, said method comprising the steps of:

   collecting the QoS data in an element of the mobile communication network;

   characterizedin that the method further comprises the steps of:

   transferring the QoS data in IP header data extension fields.

2. Method according to claim 1, **characterized in that** each QoS value is preceded in the IP packet by a header field telling the QoS data desired.

3. Method according to claim 1 or 2, **characterized in that** the header field consists of a message type field, an requester field, a direction field and a type field.

4. Method according to claim 1, 2 or 3, **characterized in that** the method further comprises the steps of:

   requesting QoS data by a Request field; and
   answering the request by a Replied field.

5. Method according to claim 1, **characterized in that**, to add QoS data to an IPv4 packet, ways of forming an extension header as defined in the RFC791 are used.

6. Method according to claim 1, **characterized in that**, to add QoS data to an IPv6 packet, ways of forming an extension header as defined in the RFC2460 are used.

7. Method according to claim 1, **characterized in that** the QoS data is pre-processed and refined into the form used by the applications that need it.

8. Method according to claim 1, **characterized in that** the QoS data in the header data extension fields is distributed to user applications.

9. Method according to claim 7 or 8, **characterized in that** a specific monitoring agent is used for pre-processing, refining, transmitting and distributing QoS data.

10. Method according to claim 1, **characterized in that** an IP packet provided with QoS data must not be fragmented.

EPODOC: <EP . ... . 1304831A2_I >

11. Monitoring agent for transferring and distributing channel-specific QoS data in a packet-switched mobile communication network,
characterized in that the monitoring agent comprises:

information retrieval means (IM) for retrieving QoS data from the QoS components of the elements of a packet-switched mobile communication network;
processing means (HM) for pre-processing and refining QoS data;
setting means (SM) for setting QoS data into the header data extension field of an IP packet;
removal means (RM) for removing QoS data from the header data extension field of an IP packet.

12. Monitoring agent according to claim 11, **characterized in that** the monitoring agent comprises communication means (CM) for distributing QoS data to applications that use QoS data.

13. System for transferring and distributing QoS data in a packet-switched mobile communication network, said system comprising:

a packet-switched mobile communication network (NET);
user equipment (UE) communicating with the packet-switched mobile communication network (NET);
QoS components (QoS) used to collect QoS data from different elements of the packet-switched mobile communication network (NET);

characterized in that the system further comprises:

a monitoring agent (MA), which comprises information retrieval means (IM) for retrieving QoS data from the QoS components (QoS) of the elements of the packet-switched mobile communication network; processing means (HM) for pre-processing and refining QoS data; setting means (SM) for setting QoS data into the header data extension field of an IP packet; and removal means (RM) for removing QoS data from the header data extension field of an IP packet.

14. System according to claim 13, **characterized in that** the system further comprises communication means (CM) for distributing QoS data to applications that use QoS data.

15. System according to claim 13 or 14, **characterized in that** the IP packet is consistent with the IPv4 or IPv6 version.

16. System according to claim 13, 14 or 15, **characterized in that** the packet-switched mobile communication network is an UMTS network.

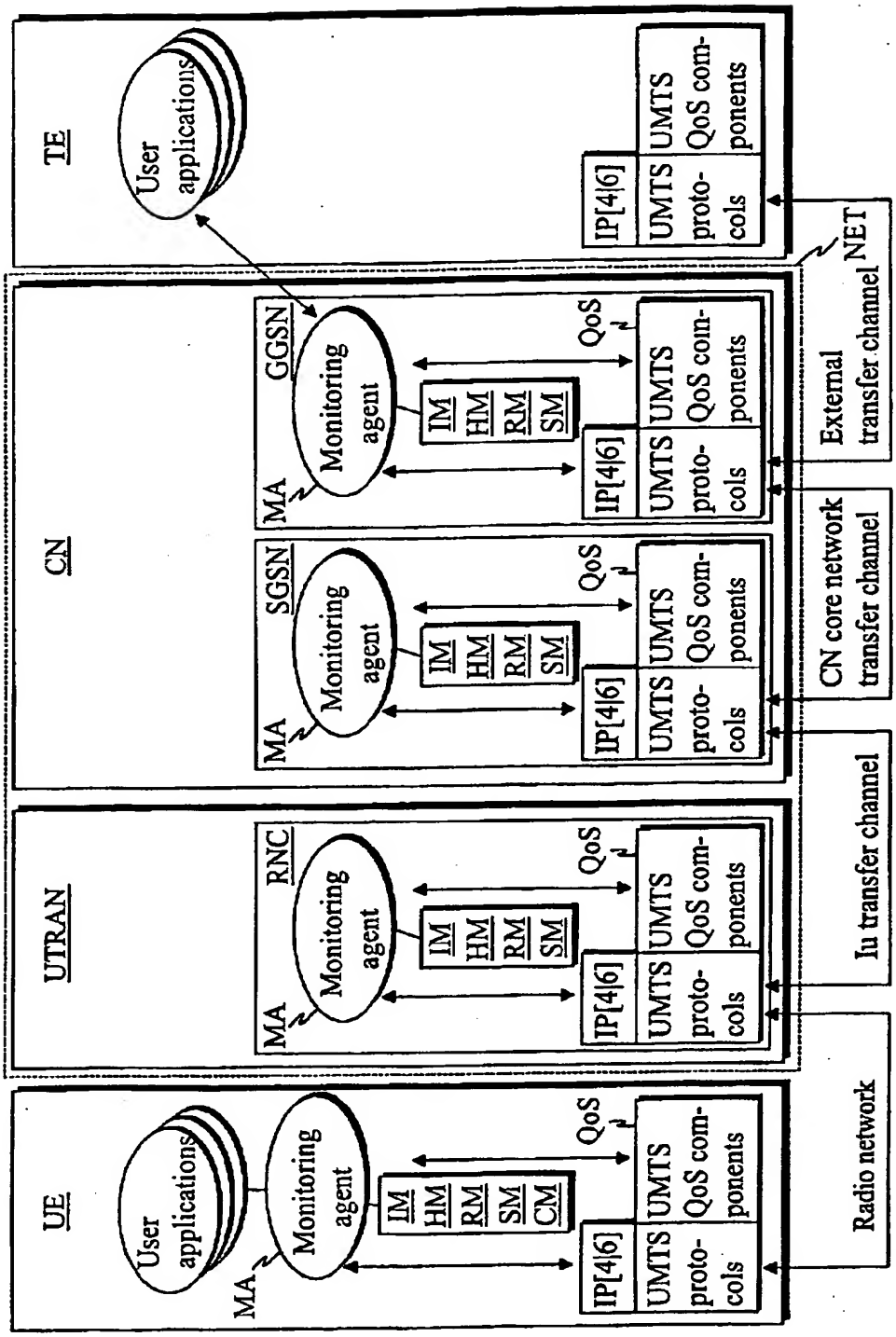


Fig. 1

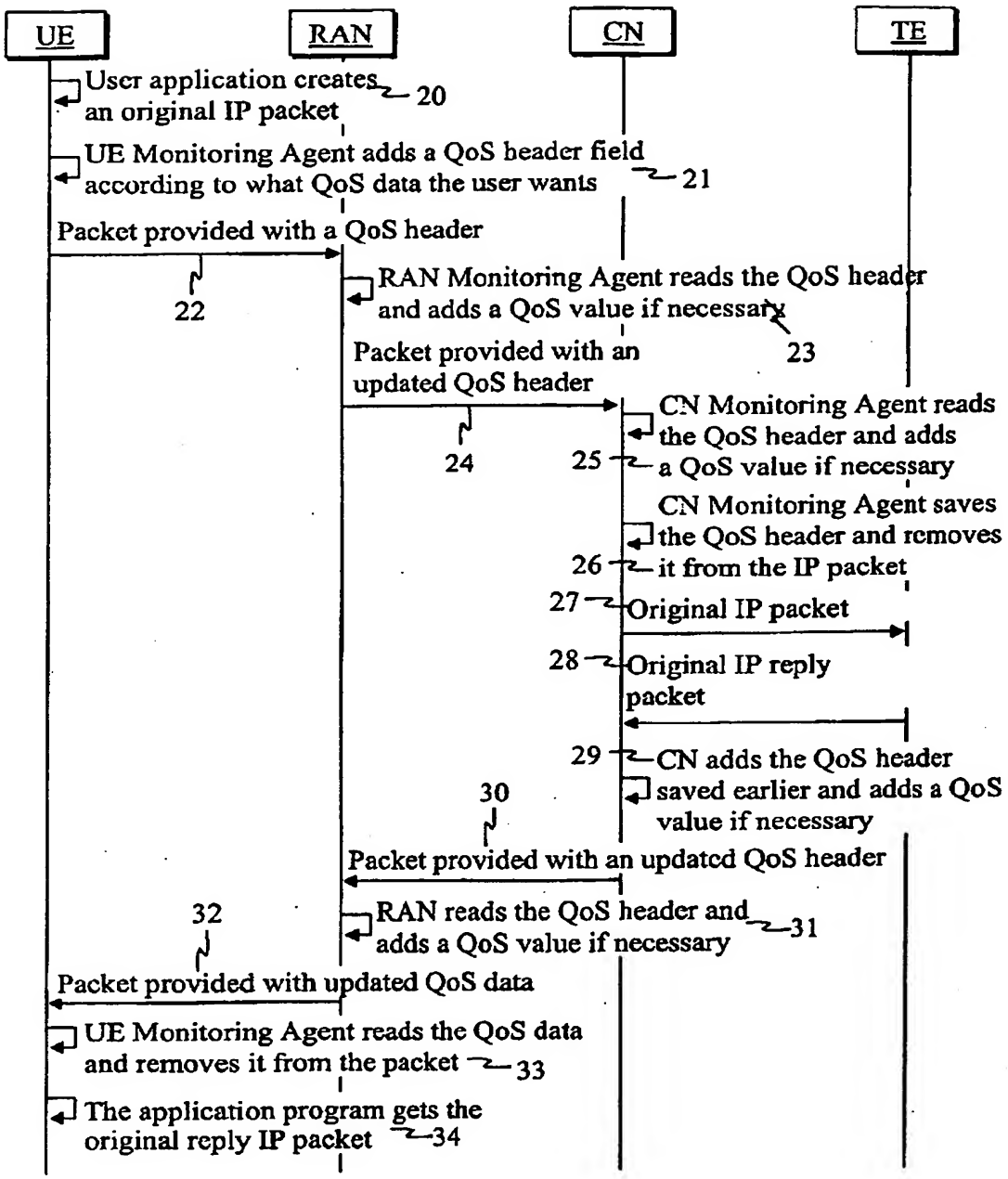


Fig. 2

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 304 831 A3

(12) EUROPEAN PATENT APPLICATION

(88) Date of publication A3:
07.05.2003 Bulletin 2003/19

(43) Date of publication A2:
23.04.2003 Bulletin 2003/17

(21) Application number: **02396118.8**

(22) Date of filing: **17.07.2002**

(51) Int Cl.[7]: **H04L 12/26**, H04L 12/24, H04L 29/06, H04Q 7/34, H04Q 7/22, H04L 12/56

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR IE IT LI LU MC NL PT SE SK TR
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **16.08.2001 FI 20011657**

(71) Applicant: **Sonera Oyj**
00510 Helsinki (FI)

(72) Inventors:
- **Korhonen, Jouni**
  11100 Riihimäki (FI)
- **Laukkanen, Mikko**
  02600 Espoo (FI)
- **Laamanen, Heimo**
  00370 Helsinki (FI)

(74) Representative: **Simmelvuo, Markku et al**
Papula Oy,
P.O. Box 981
00101 Helsinki (FI)

(54) Monitoring and transmission of QoS-data in a telecommunication network

(57) The invention concerns a method and system for monitoring, transferring and distributing channel-specific QoS data in a packet-switched mobile communication network, in which method QoS data is collected in an element of the mobile communication network. According to the invention, the QoS data is carried in extension fields of IP header data. The invention also concerns a monitoring agent for monitoring, transferring and distributing channel-specific QoS data in a packet-switched mobile communication network.

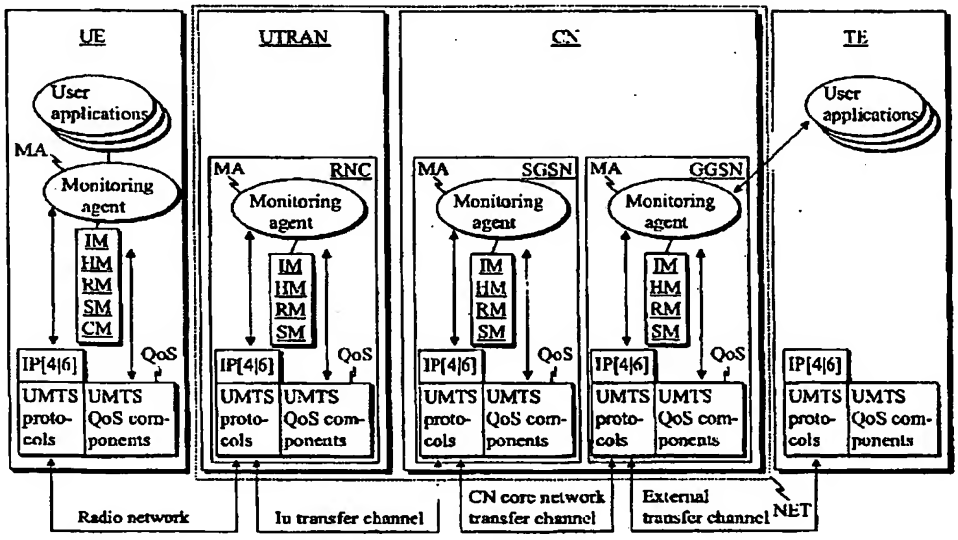


Fig. 1

Printed by Jouve, 75001 PARIS (FR)

EPODOC: <EP_____1304831A3 I_>

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 02 39 6118

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	EP 1 113 628 A (NORTEL NETWORKS LTD) 4 July 2001 (2001-07-04) * abstract * * paragraph [0002] * * paragraphs [0024],[0025] * * paragraphs [0032],[0035],[0038] * * figure 6 * * paragraph [0042] * ---	1-16	H04L12/26 H04L12/24 H04L29/06 H04Q7/34 H04Q7/22 H04L12/56
A	US 2001/001268 A1 (SOLA ISMAIL I ET AL) 17 May 2001 (2001-05-17) * abstract * * column 5, paragraph 89 * * column 10, paragraphs 163-165 * * paragraphs [0323]-[0329] * * paragraphs [0440]-[0442] * ---	1-16	
A	ONOE Y ET AL: "Evaluation of media scaling applied multicast protocol" REAL-TIME COMPUTING SYSTEMS AND APPLICATIONS, 1997. PROCEEDINGS., FOURTH INTERNATIONAL WORKSHOP ON TAIPEI, TAIWAN 27-29 OCT. 1997, LOS ALAMITOS, CA, USA,IEEE COMPUT. SOC, US, 27 October 1997 (1997-10-27), pages 26-33, XP010251843 ISBN: 0-8186-8073-3 * abstract * * paragraph [03.2] * * paragraph [0004] * * paragraph [0007] * --- -/--	1-16	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)
H04L
H04Q

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	12 March 2003	Cichra, N

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 02 39 6118

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	EP 0 975 123 A (ERICSSON TELEFON AB L M) 26 January 2000 (2000-01-26) * abstract * * paragraph [0038] * * paragraphs [0042],[0043] * * paragraphs [0084],[0085] * * paragraph [0091] * ---	1-16	
A	JANEVSKI T ET AL: "QoS analyses of multimedia traffic in heterogeneous wireless IP networks" UNIVERSITY SKOPJE, INSTITUTE OF TELECOMMUNICATIONS, XP010534043 Skopje * the whole document * -----	1-16	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	12 March 2003	Cichra, M

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 02 39 6118

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

12-03-2003

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1113628 A	04-07-2001	AU 6959400 A	05-07-2001
		CA 2324064 A1	28-06-2001
		EP 1113628 A2	04-07-2001
US 2001001268 A1	17-05-2001	CN 1350741 T	22-05-2002
		EP 1142266 A1	10-10-2001
		JP 2002534002 T	08-10-2002
		WO 0038391 A1	29-06-2000
		US 2001022784 A1	20-09-2001
		US 2002048268 A1	25-04-2002
EP 0975123 A	26-01-2000	EP 0973302 A1	19-01-2000
		EP 0975123 A1	26-01-2000
		AU 4904199 A	07-02-2000
		CA 2337050 A1	27-01-2000
		CN 1318241 T	17-10-2001
		WO 0004680 A1	27-01-2000
		EP 1097548 A1	09-05-2001
		JP 2002521866 T	16-07-2002

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

This Page is Inserted by IFW Indexing and Scanning Operations and is not part of the Official Record

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☑ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☑ FADED TEXT OR DRAWING
- ☑ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☑ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.
As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.